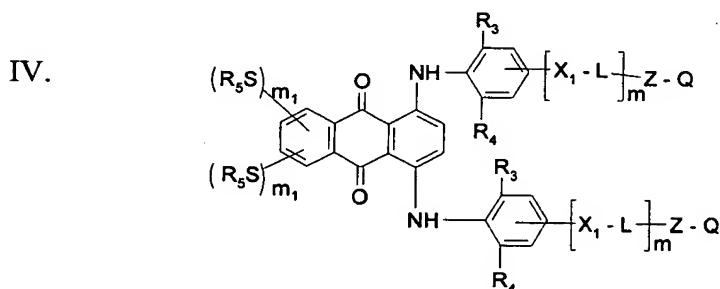
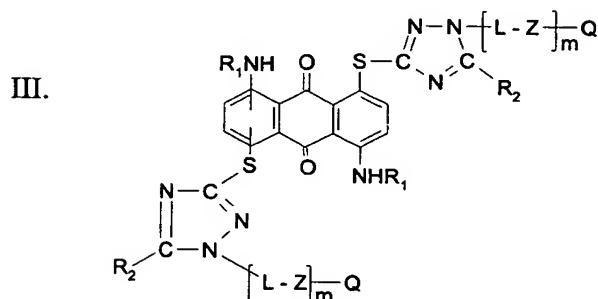
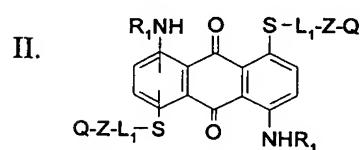
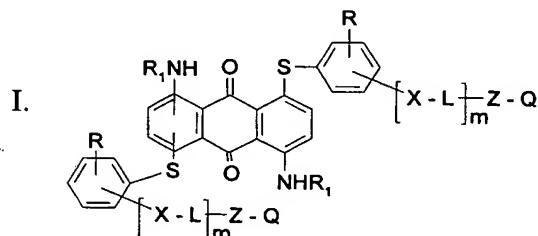
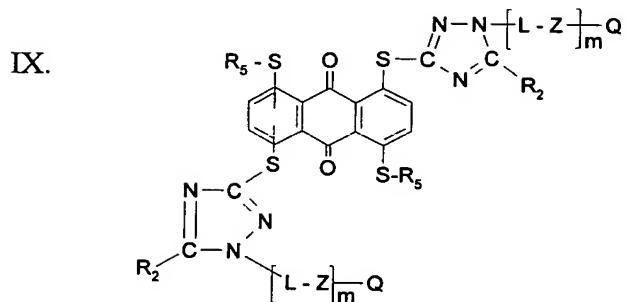
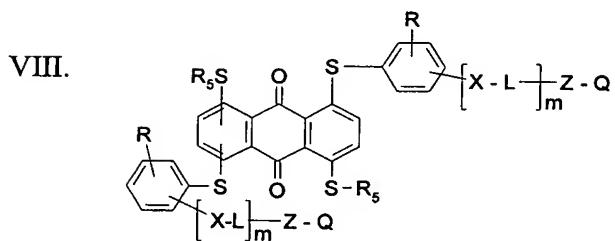
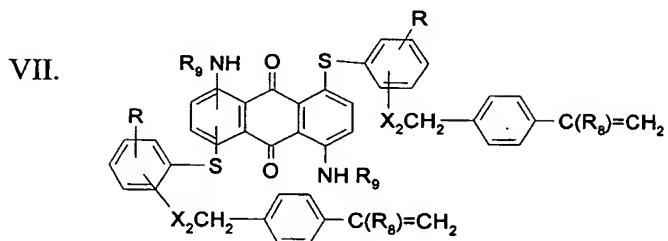
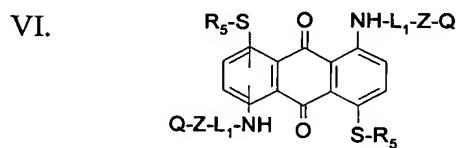
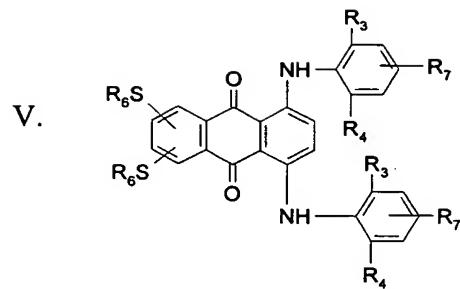


## CLAIMS

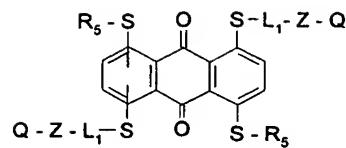
We claim:

1. Anthraquinone dye compounds having the formulae:

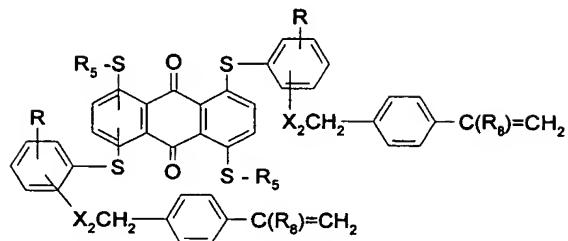




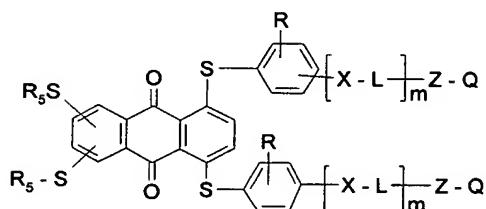
X.



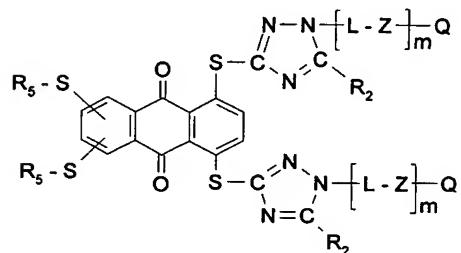
XI.



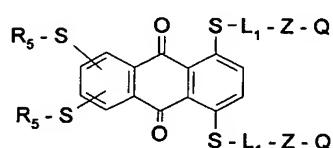
XII.



XIII.

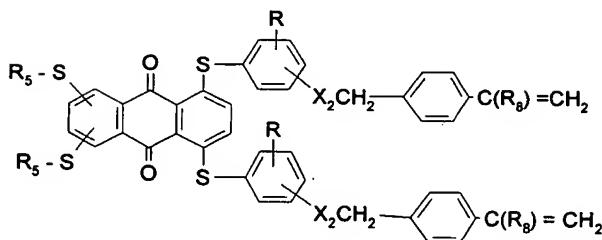


XIV.

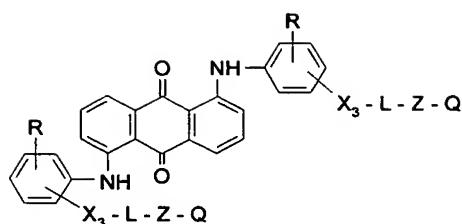


5

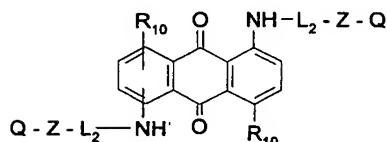
XV.



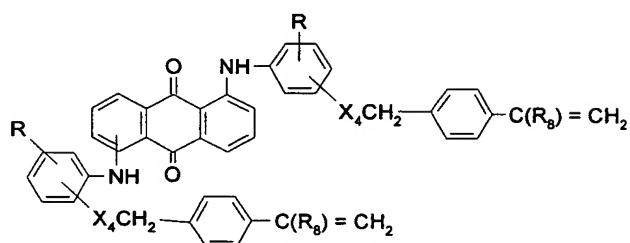
XVI.



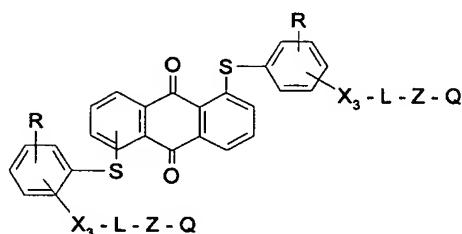
XVII.



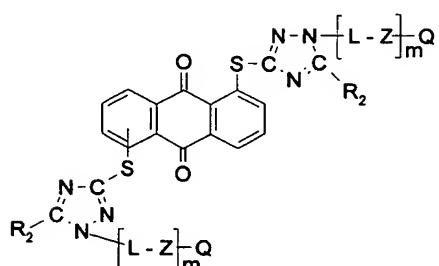
XVIII.



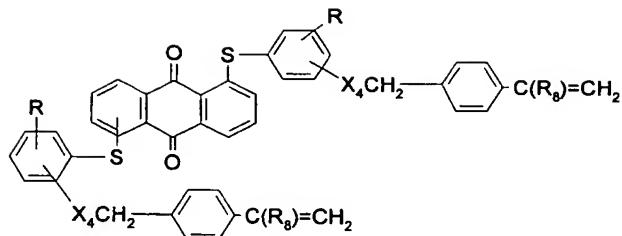
XIX.



XX.



XXI.



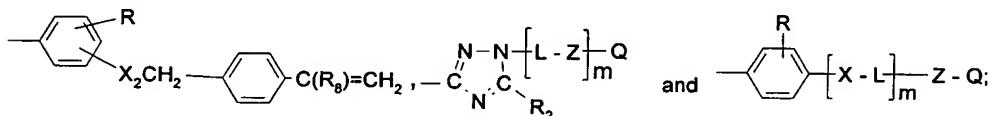
wherein:

R is selected from hydrogen or 1-3 groups selected from  $C_1 - C_6$ -alkyl,  $C_1 - C_6$ -alkoxy and halogen;

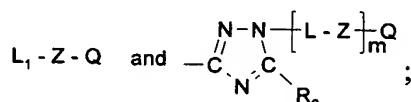
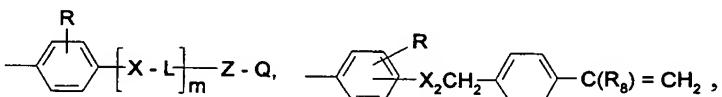
5         $R_1$  is selected from  $C_1 - C_6$ -alkyl, substituted  $C_1 - C_6$ -alkyl,  $C_3 - C_8$ -alkenyl,  $C_3 - C_8$ -cycloalkyl, aryl and  $-L_1-Z-Q$ ;  $R_2$  = selected from hydrogen,  $C_1 - C_6$ -alkyl, substituted  $C_1 - C_6$ -alkyl,  $C_3 - C_8$ -cycloalkyl and aryl;

$R_3$  and  $R_4$  are independently selected from  $C_1 - C_6$ -alkyl and bromine;

10       $R_5$  is selected from  $C_1 - C_6$ -alkyl, substituted  $C_1 - C_6$  alkyl,  $C_3 - C_8$ -cycloalkyl, aryl, heteroaryl,  $-L_1-Z-Q$ ,



$R_6$  is selected from



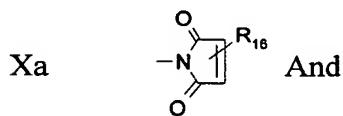
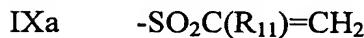
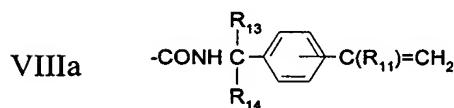
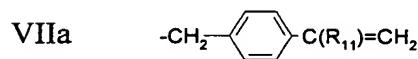
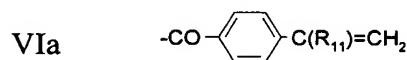
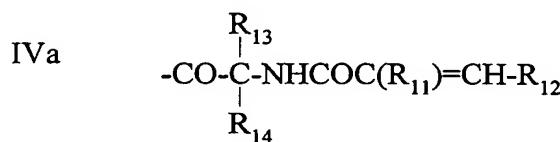
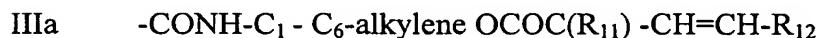
15       $R_7$  is selected from hydrogen, substituted or unsubstituted  $C_1 - C_6$ -alkyl,  $C_1 - C_6$ -alkoxy, halogen, hydroxy, substituted or unsubstituted  $C_1 - C_6$ -alkylthio, sulfamoyl and substituted sulfamoyl;

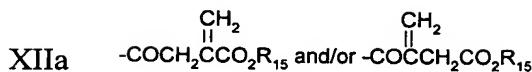
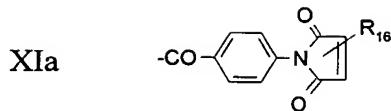
$R_8$  is selected from hydrogen and  $C_1 - C_6$ -alkyl;

$R_9$  is selected from the groups represented by  $R_1$  and  $-L - Z - Q$ ;

- R<sub>10</sub> is selected from hydrogen and halogen;
- X is a covalent bond or a divalent linking group selected from -O-, -S-, -SO<sub>2</sub>-, -CO<sub>2</sub>-, -CON(Y)- and -SO<sub>2</sub>N(Y)-, wherein Y is selected from hydrogen, C<sub>1</sub>-C<sub>6</sub>-alkyl, substituted C<sub>1</sub>-C<sub>6</sub>-alkyl, C<sub>3</sub>-C<sub>8</sub>-cycloalkyl, C<sub>3</sub>-C<sub>8</sub>-alkenyl, aryl and 5 -L-Z- Q;
- X<sub>1</sub> is selected from -O-, -S-, -SO<sub>2</sub>- and -SO<sub>2</sub>N(Y)-;
- X<sub>2</sub> is selected from -CO<sub>2</sub>- and -SO<sub>2</sub>N(Y<sub>1</sub>), wherein Y<sub>1</sub> is a group selected from hydrogen, C<sub>1</sub>-C<sub>6</sub>-alkyl, substituted C<sub>1</sub>-C<sub>6</sub>-alkyl, C<sub>3</sub>-C<sub>8</sub>-alkenyl, C<sub>3</sub>-C<sub>8</sub>-cycloalkyl, aryl, heteroaryl and -CH<sub>2</sub>-p-C<sub>6</sub>H<sub>4</sub>-C(R<sub>8</sub>)=CH<sub>2</sub>;
- 10 X<sub>3</sub> is selected from -CO<sub>2</sub>-, -SO<sub>2</sub>N(Y)-;
- X<sub>4</sub> is selected from -CO<sub>2</sub>-, -O- and -SO<sub>2</sub>N(Y<sub>1</sub>)-;
- L is a divalent linking group selected from C<sub>1</sub>-C<sub>8</sub>-alkylene, C<sub>1</sub>-C<sub>6</sub>-alkylene-arylene, arylene, C<sub>1</sub>-C<sub>6</sub>-alkylene-arylene, C<sub>1</sub>-C<sub>6</sub>-alkylene-arylene -C<sub>1</sub>-C<sub>6</sub>-alkylene, C<sub>3</sub>-C<sub>8</sub>-cycloalkylene, C<sub>1</sub>-C<sub>6</sub>-alkylene -C<sub>3</sub>-C<sub>8</sub>-cycloalkylene -C<sub>1</sub>-C<sub>6</sub>-alkylene, C<sub>1</sub>-C<sub>6</sub>-alkylene - Z<sub>1</sub>-arylene 15 -Z<sub>1</sub>-C<sub>1</sub>-C<sub>6</sub>-alkylene and C<sub>2</sub>-C<sub>6</sub>-alkylene-[-Z<sub>1</sub>-C<sub>2</sub>-C<sub>6</sub>-alkylene-]<sub>n</sub>- wherein Z<sub>1</sub> is selected from -O-, -S- and -SO<sub>2</sub>- and n is 1-3;
- L<sub>1</sub> is a divalent linking group selected from C<sub>2</sub> - C<sub>6</sub>-alkylene, C<sub>1</sub>-C<sub>6</sub>-alkylene-C<sub>3</sub>-C<sub>8</sub>-cycloalkylene-C<sub>1</sub>-C<sub>6</sub>-alkylene, C<sub>1</sub>-C<sub>6</sub>-alkylene-arylene, C<sub>3</sub>-C<sub>8</sub>-cycloalkylene, and C<sub>2</sub>-C<sub>6</sub>-alkylene-[-Z<sub>1</sub>-C<sub>2</sub>-C<sub>6</sub>-alkylene-]<sub>n</sub>-;
- 20 L<sub>2</sub> is selected from C<sub>2</sub>-C<sub>6</sub>-alkylene, C<sub>1</sub>-C<sub>6</sub>-alkylene- arylene-C<sub>1</sub>-C<sub>6</sub> alkylene and C<sub>1</sub>-C<sub>6</sub>-alkylene-C<sub>3</sub>-C<sub>8</sub>-cycloalkylene-C<sub>1</sub>-C<sub>6</sub>-alkylene;
- Z is a divalent group selected from -O-, -S-, -NH-, -N(C<sub>1</sub>-C<sub>6</sub>-alkyl)-, -N(C<sub>3</sub>-C<sub>8</sub> alkenyl)-, -N(C<sub>3</sub>-C<sub>8</sub> cycloalkyl)-, -N(aryl)-, -N(SO<sub>2</sub>C<sub>1</sub>-C<sub>6</sub>-alkyl) and -N(SO<sub>2</sub> aryl)-, provided that when Q is a photopolymerizable optionally substituted 25 maleimide radical, Z represents a covalent bond; Q is an ethylenically-unsaturated, photosensitive polymerizable group; and
- m and m<sub>1</sub> each is 0 or 1.

2. Anthraquinone compounds according to Claim 1 wherein the ethylenically-unsaturated, photosensitive copolymerizable groups represented by Q are selected from the following organic radicals:





wherein:

R<sub>11</sub> is selected from hydrogen and C<sub>1</sub>-C<sub>6</sub>-alkyl;

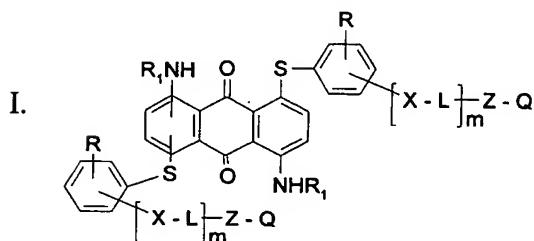
5 R<sub>12</sub> is selected from hydrogen; C<sub>1</sub>-C<sub>6</sub>-alkyl; phenyl and phenyl substituted with one or more groups selected from C<sub>1</sub>-C<sub>6</sub>-alkyl, C<sub>1</sub>-C<sub>6</sub>-alkoxy, -N(C<sub>1</sub>-C<sub>6</sub>-alkyl), nitro, cyano, C<sub>1</sub>-C<sub>6</sub>-alkoxycarbonyl, C<sub>1</sub>-C<sub>6</sub>-alkanoyloxy and halogen; 1- and 2-naphthyl which may be substituted with C<sub>1</sub>-C<sub>6</sub>-alkyl or C<sub>1</sub>-C<sub>6</sub>-alkoxy; 2- and 3-thienyl which may be substituted with C<sub>1</sub>-C<sub>6</sub>-alkyl or halogen; 2- or 3-furyl which may be substituted with C<sub>1</sub>-C<sub>6</sub>-alkyl;

10 R<sub>13</sub> and R<sub>14</sub> are selected from hydrogen, C<sub>1</sub>-C<sub>6</sub>-alkyl, substituted C<sub>1</sub>-C<sub>6</sub>-alkyl, aryl or may be combined to represent a -[-CH<sub>2</sub>-]<sub>3-5</sub>- radical;

R<sub>15</sub> is selected from hydrogen, C<sub>1</sub>-C<sub>6</sub>-alkyl, substituted C<sub>1</sub>-C<sub>6</sub>-alkyl, C<sub>3</sub>-C<sub>8</sub>-alkenyl, C<sub>3</sub>-C<sub>8</sub>-cycloalkyl and aryl;

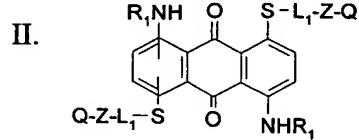
R<sub>16</sub> is selected from hydrogen, C<sub>1</sub> - C<sub>6</sub>-alkyl and aryl.

15 3. Anthraquinone compounds according to Claim 2 having the formula:



wherein Z is -O-.

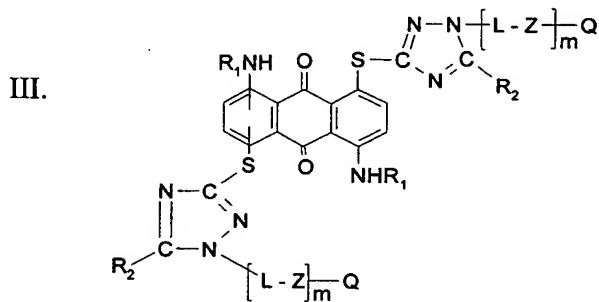
4. Anthraquinone compounds according to Claim 2 having the formula:



wherein Z is -O-.

5

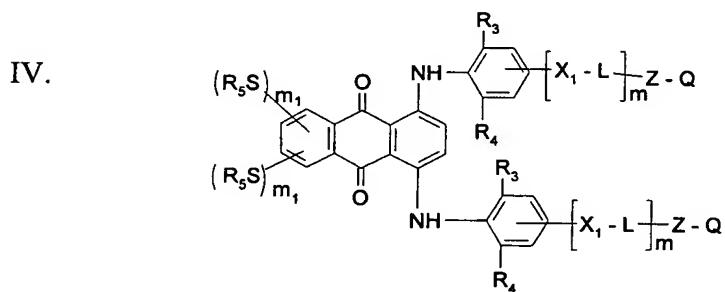
5. Anthraquinone compounds according to Claim 2 having the formula:



wherein Z is -O-.

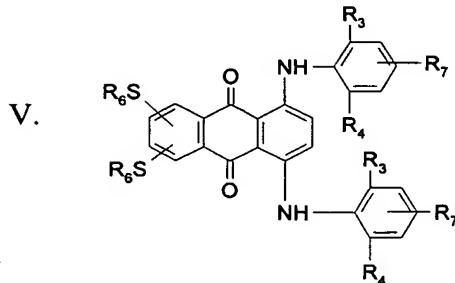
10

6. Anthraquinone compounds according to Claim 2 having the formula:



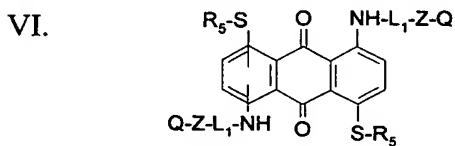
wherein Z is -O-.

7. Anthraquinone compounds according to Claim 2 having the formula:



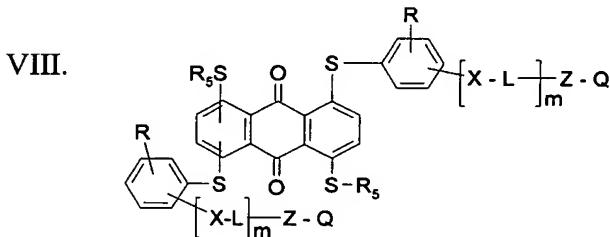
wherein Z is -O-.

5 8. Anthraquinone compounds according to Claim 2 having the formula:



wherein Z is -O-.

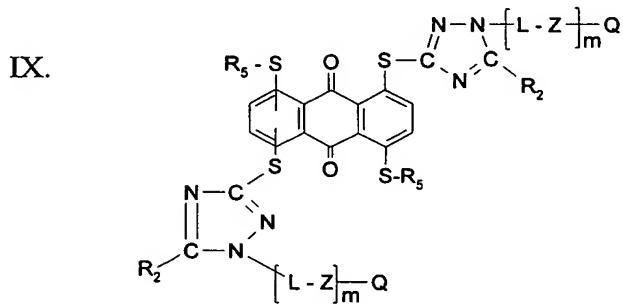
9. Anthraquinone compounds according to Claim 2 having the formula:



10

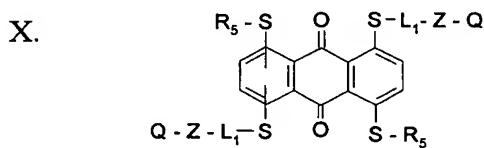
wherein Z is -O-.

10. Anthraquinone compounds according to Claim 2 having the formula:



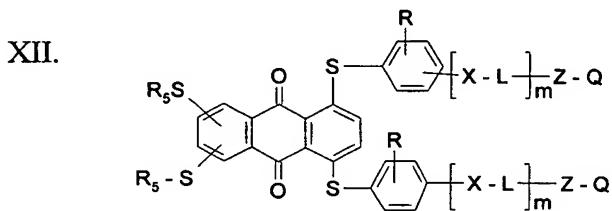
wherein Z is -O-.

5 11. Anthraquinone compounds according to Claim 2 having the formula:



wherein Z is -O-.

12. Anthraquinone compounds according to Claim 2 having the formula:

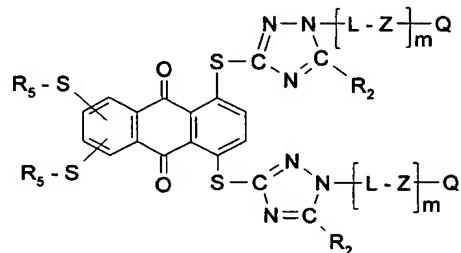


10

wherein Z is -O-.

13. Anthraquinone compounds according to Claim 2 having the formula:

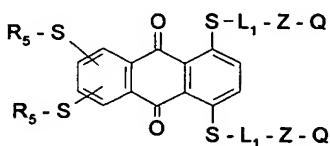
XIII.



wherein  $Z$  is  $-O-$ .

5 14. Anthraquinone compounds according to Claim 2 having the formula:

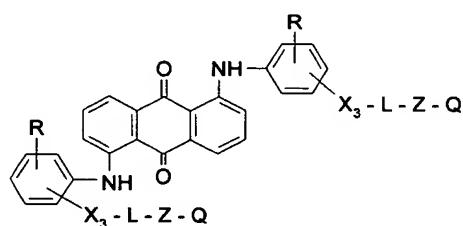
XIV.



wherein  $Z$  is  $-O-$ .

15. Anthraquinone compounds according to Claim 2 having the formula:

XVI.

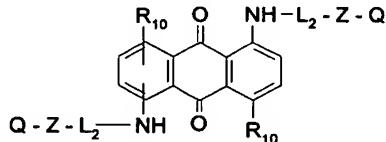


10

wherein  $Z$  is  $-O-$ .

16. Anthraquinone compounds according to Claim 2 having the formula:

XVII.

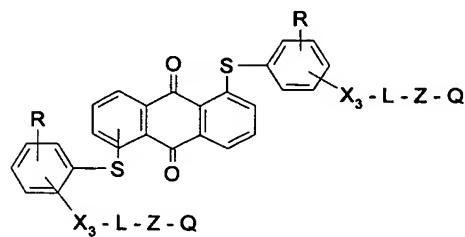


15

wherein  $Z$  is  $-O-$ .

17. Anthraquinone compounds according to Claim 2 having the formula:

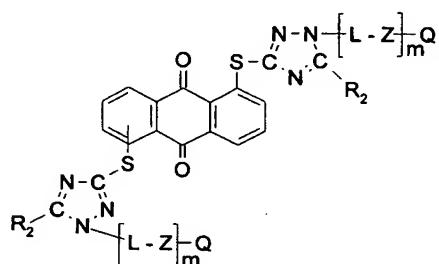
XIX.



wherein Z is -O-.

5 18. Anthraquinone compounds according to Claim 2 having the formula:

XX.



wherein Z is -O-.

10 19. Anthraquinone compounds according to Claim 2 wherein Q is organic radical Ia.

20. Anthraquinone compounds according to Claim 2 wherein Q is organic radical Ia wherein R<sub>11</sub> is hydrogen or methyl and R<sub>12</sub> is hydrogen.

15 21. Anthraquinone compounds according to Claim 2 wherein Q is organic radical VIIa.

22. Anthraquinone compounds according to Claim 2 wherein Q is organic radical VIIa wherein R<sub>11</sub> is hydrogen.

20

23. Anthraquinone compounds according to Claim 2 wherein Q is organic radical VIIa.
- 5 24. Anthraquinone compounds according to Claim 2 wherein Q is organic radical VIIa wherein R<sub>11</sub> is hydrogen or methyl and R<sub>13</sub> and R<sub>14</sub> are methyl. .
25. Anthraquinone compounds according to Claim 3 wherein X is -CO<sub>2</sub>-, L is -CH<sub>2</sub>CH<sub>2</sub>-, and m is 1.
- 10 26. Anthraquinone compounds according to Claim 5 wherein L is -CH<sub>2</sub>CH<sub>2</sub>-, m is 1, and R<sub>2</sub> is hydrogen.
27. Anthraquinone compounds according to Claim 8 wherein L<sub>1</sub> is -CH<sub>2</sub>C(CH<sub>3</sub>)<sub>2</sub>CH<sub>2</sub>- and R<sub>5</sub> is aryl.
- 15 28. Anthraquinone compounds according to Claim 9 wherein X is -CO<sub>2</sub>-, L is -CH<sub>2</sub>CH<sub>2</sub>-, and m is 1.
29. Anthraquinone compounds according to Claim 10 wherein L is -CH<sub>2</sub>CH<sub>2</sub>-, R<sub>2</sub> is hydrogen and m is 1.
- 20 30. Anthraquinone compounds according to Claim 12 wherein X is -CO<sub>2</sub>-, L is -CH<sub>2</sub>CH<sub>2</sub>-, and m is 1.
- 25 31. Anthraquinone compounds according to Claim 13 wherein L is -CH<sub>2</sub>CH<sub>2</sub>-, R<sub>2</sub> is hydrogen and m is 1.
32. Anthraquinone compounds according to Claim 15 wherein X<sub>3</sub> is -CO<sub>2</sub>-, L is -CH<sub>2</sub>CH<sub>2</sub>-, and R is hydrogen or bromine.

33. Anthraquinone compounds according to Claim 15 wherein  $X_3$  is  $-CO_2-$ , L is propylene, 1,4-cyclohexylenedimethylene or 2,2-dimethyltrimethylene, R is hydrogen, Z is  $-O-$ , and Q is an organic radical having the structure  $-COC(R_{11})=CH_2$  wherein  $R_{11}$  is hydrogen, methyl or ethyl.

5

34. Anthraquinone compounds according to Claim 15 wherein  $X_3$  is  $-CO_2-$ , L is propylene, 1,4-cyclohexylenedimethylene or 2,2-dimethyltrimethylene, R is hydrogen, Z is  $-O-$ , and Q is an organic radical having structure VIIIa wherein  $R_{11}$ ,  $R_{13}$  and  $R_{14}$  each is methyl.

10

35. Anthraquinone compounds according to Claim 16 wherein  $L_2$  is  $-CH_2C(CH_3)_2CH_2-$ , and  $R_{10}$  is hydrogen.

15

36. Anthraquinone compounds according to Claim 17 wherein  $X_3$  is  $-CO_2-$ , L is  $-CH_2CH_2-$ , and R is hydrogen.

20

37. Anthraquinone compounds according to Claim 17 wherein  $X_3$  is  $-CO_2-$ , L is propylene, 1,4-cyclohexylenedimethylene or 2,2-dimethyltrimethylene, R is hydrogen, Z is  $-O-$ , and Q is an organic radical having the structure  $-COC(R_{11})=CH_2$  wherein  $R_{11}$  is hydrogen, methyl or ethyl.

25

38. Anthraquinone compounds according to Claim 17 wherein  $X_3$  is  $-CO_2-$ , L is propylene, 1,4-cyclohexylenedimethylene or 2,2-dimethyltrimethylene, R is hydrogen, Z is  $-O-$ , and Q is an organic radical having structure VIIIa wherein  $R_{11}$ ,  $R_{13}$  and  $R_{14}$  each is methyl.

39. Anthraquinone compounds according to Claim 18 wherein L is  $-CH_2CH_2-$ ,  $R_2$  is hydrogen, and m is 1.

40. Anthraquinone compounds according to Claim 6 wherein X is  $-\text{SO}_2\text{N}(\text{Y})-$ , L is  $\text{C}_2\text{-C}_6$  alkylene,  $\text{R}_3$  and  $\text{R}_4$  are methyl or ethyl, Y is hydrogen, m is 1 and  $\text{m}_1$  is 0.

5 41. Anthraquinone compounds according to Claim 6 wherein X is  $-\text{SO}_2\text{N}(\text{Y})-$ , L is  $\text{C}_2\text{-C}_6$  alkylene,  $\text{R}_3$  and  $\text{R}_4$  are methyl or ethyl, Y is hydrogen, m is 1 and  $\text{m}_1$  is 1.

10 42. Anthraquinone compounds according to Claim 1 having formula VII wherein  $\text{X}_2$  is  $-\text{CO}_2-$  and R and  $\text{R}_8$  are hydrogen.

43. Anthraquinone compounds according to Claim 1 having formula XI wherein  $\text{X}_2$  is  $-\text{CO}_2-$  and  $\text{R}_1$  and  $\text{R}_8$  are hydrogen.

15 44. Anthraquinone compounds according to Claim 1 having formula XVII wherein  $\text{X}_4$  is  $-\text{CO}_2-$  and R and  $\text{R}_8$  are hydrogen.

45. Anthraquinone compounds according to Claim 1 having formula XXI wherein  $\text{X}_4$  is  $-\text{CO}_2-$  and R and  $\text{R}_8$  are hydrogen.

20 46. Anthraquinone compounds according to Claim 1 having formula IV wherein  $\text{X}_1$  is  $-\text{O}-$ , Z is  $-\text{O}-$ , L is  $-\text{CH}_2\text{CH}_2-$ ,  $\text{R}_3$  and  $\text{R}_4$  are methyl or ethyl, m is 1 and  $\text{m}_1$  is 0.

25 47. A coating composition comprising (i) one or more polymerizable vinyl compounds, (ii) one or more of the dye compounds of Claim 1, and (iii) a photoinitiator.

30 48. A coating composition according to Claim 47 comprising (i) one or more polymerizable vinyl compounds, (ii) one or more of the dye compounds of Claim 2

present in a concentration of about 0.05 to 15 weight percent based on the weight of component (i), and (iii) a photoinitiator present in a concentration of about 1 to 15 weight percent based on the weight of the polymerizable vinyl compound(s) present in the coating composition.

5

49. A coating composition according to Claim 48 wherein the polymerizable vinyl compounds comprise a solution of a polymeric, polymerizable vinyl compound selected from acrylated and methacrylated polyesters, acrylated and methacrylated polyethers, acrylated and methacrylated epoxy polymers, acrylated or methacrylated urethanes, and mixtures thereof, in a diluent selected from monomeric acrylate and methacrylate esters.

10

50. A polymeric coating composition comprising a polymer of one or more acrylic acid esters, one or more methacrylic acid esters and/or other copolymerizable vinyl compounds, having copolymerized therein one or more of the dye compounds defined in Claim 1.

15

51. A polymeric composition according to Claim 50 comprising a coating of an acrylic polymer of one or more acrylic acid esters, one or more methacrylic acid esters or a mixture thereof having copolymerized therein one or more of the dye compounds defined in Claim 2.

20

52. A polymeric composition according to Claim 50 comprising a coating of an unsaturated polyester containing one or more maleate/fumarate residues; one or more monomers which contain one or more vinyl ether groups, one or more vinyl ester groups, or a combination thereof, and, optionally, one or more acrylic or methacrylic acid esters; or a mixture thereof having copolymerized therein one or more of the dye compounds defined in Claim 2.

25

53. A polymeric coating according to Claim 51 containing from about 0.05 to 15.0 weight percent of the residue of one or more of the dye compounds of Claim 2 based on the weight of the coating.